SUPERMAX ELECTROMETER

REF 90018

User Manual

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STANDARD IMAGING.

General Precautions

Warnings and Cautions alert users to dangerous conditions that can occur if instructions in the manual are not obeyed. Warnings are conditions that can cause injury to the operator, while Cautions can cause damage to the equipment.

WARNING:
An electrical shock hazard of up to 1000 VDC is possible whenever the bias voltage is active. Always set the bias to the 0% or 0 VDC level whenever a device is connected to or disconnected from the SuperMAX.

WARNING:
The SuperMAX is not intended to be used in flammable mixture atmospheres. Do not use with flammable anesthetic mixture with air, with oxygen, or nitrous oxide.

CAUTION:
Proper use of this device depends on careful reading of all instructions and labels.

CAUTION:
Input voltage on triax connector should be no greater than +5 V or -5 V.

CAUTION:
This device should never be submerged in water or a solvent to clean, or scrubbed with an abrasive cleaner as it is not protected against liquid ingress.

CAUTION:
Do not drop or mishandle unit. Calibration factor changes may result.

CAUTION:
Do not use sharp objects on the touch screen or speaker holes.

CAUTION:
Do not disassemble unit since it may result in change of calibration factor. Refer servicing to qualified individuals.

CAUTION:
Damaged or kinked ionization chamber cables or extension cables should not be used.

CAUTION:
Upon power on, allow for proper warm-up.

CAUTION:
Charge measurements made in modes other than those used by the calibration agency may result in measurement errors which exceed the calibration uncertainty.

CAUTION:
Temperature/pressure correction is only applied to radiological units. It is not applied to electrical units.

CAUTION:
Proper use of this device requires a current calibration. Calibrations should be completed every 2 years.

CAUTION:
The SuperMAX should not be connected to an ion or well chamber which is used in direct contact with a patient.

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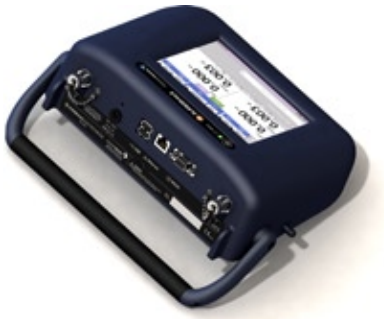

SUPERMAX ELECTROMETER

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About the SuperMAX Electrometer

The SuperMAX is a high-end, reference grade 2-channel electrometer based on MAX 4000 measurement technology, with added chamber library, voltage requirements, readout capability (dose & dose rate) and triggered (threshold) detection. Control of the SuperMAX is handled by a large, color LCD touchscreen for fast and easy operation, as well as convenient display of many measurement parameters simultaneously.

Certified initial and 2-year calibrations of the SuperMAX may be provided by an accredited dosimetry calibration laboratory (ADCL).

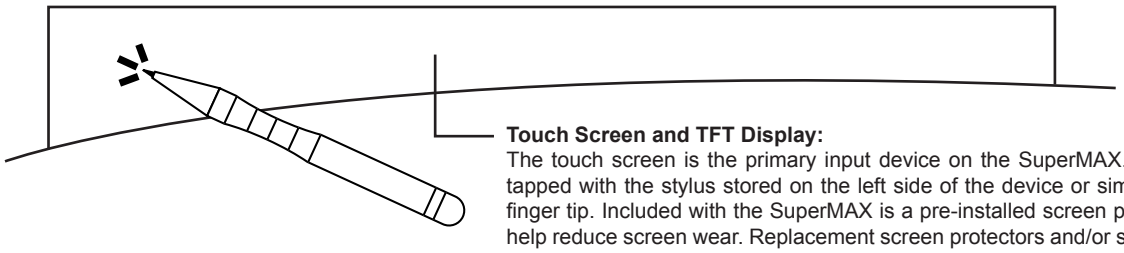
NOTE: This user manual refers to version 1.1 of the SuperMAX software. Please contact Standard Imaging about receiving the latest SuperMAX software version or a user manual for your version. See SuperMAX startup/ splash screen to see your software's version number.

SuperMAX Electrometer Front Panel Description

Power/Standby Button:
Pressing this button when the green LED (Device On/Booting Indicator) is not lit will start the SuperMAX interface. Pressing this button when the green LED is lit will put the SuperMAX into standby mode. Full power off cannot be achieved unless the SuperMAX is unplugged.

Device On/Booting Indicator:
Upon plugging the SuperMAX into AC mains power, this green LED will blink for several moments indicating the device is booting its internal operating system. The SuperMAX is turned on and ready for operation when the LED stops blinking and remains a solid green color.

Mains Power Indicator:
This amber LED indicates that the SuperMAX is plugged in and AC mains power is present.



Touch Screen and TFT Display:
The touch screen is the primary input device on the SuperMAX. It can be tapped with the stylus stored on the left side of the device or simply with a finger tip. Included with the SuperMAX is a pre-installed screen protector to help reduce screen wear. Replacement screen protectors and/or styli can be ordered from Standard Imaging.

SuperMAX Electrometer Rear Panel Description

Measurement Channels:
Connect an ion chamber, well chamber or other compatible measurement device to either channel.

USB Ports (2):
These ports support the insertion of the supplied USB flash drive for saving measurement data. Replacement USB flash drives can be ordered from Standard Imaging.

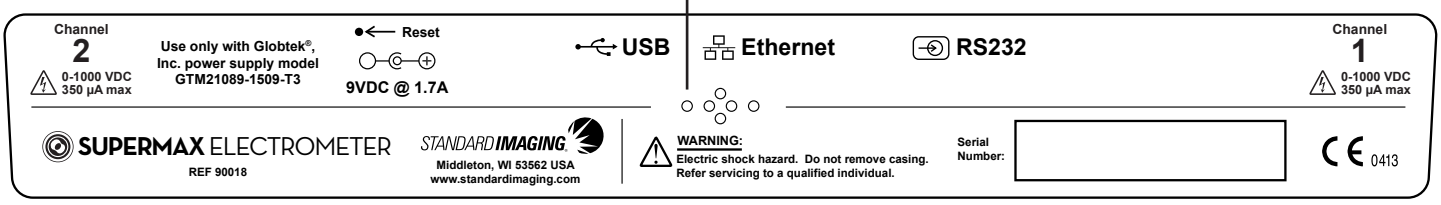
Reset Button:
Use the pin-hole reset button if the SuperMAX becomes unresponsive and "locks up" during operation. Using the reset button will not erase the SuperMAX internal memory.

Speaker Holes (6):
These holes are for the SuperMAX internal speaker. Prevent any objects or liquids from entering the holes.

RS232 Port:
At this time, the RS232 port is used for Standard Imaging internal use only.

Ethernet Port:
At this time, the ethernet port is used for Standard Imaging internal use only.

Power Adapter Input:
Use only with provided power supply.



The following are simplified, generalized instructions for taking measurements with the SuperMAX electrometer. The sections in this manual following General Operation give a much more detailed look at the various functionality of the SuperMAX.

1. Connect the detachable AC power cord to the provided Globtek®, Inc. power supply, attach the AC power cord to a grounded 120 VAC or 220/240 VAC 50/60 Hz power outlet, and connect the power supply to the SuperMAX Electrometer power adapter input.

2. With nothing connected to either channel of the SuperMAX, turn the power on and wait for at least the recommended 1 minute for the electrometer to warm-up.

3. The Channel 1 interface will appear after the recommended warm-up period is complete or bypassed. From here several options within the main menu (top left corner) are accessible. This example will cover operation remaining in Channel 1 mode, however basic operation within Channel 2 or Channel 1/2 modes is similar (see page 7 for detailed use of measurement features).

4. Select the desired Range of Operation, Low or High from the on-screen pull down menu (see page 8).

5. Press the Zero button to perform the electrometer zero adjustment (see page 8). This will take approximately 30 seconds to complete.

6. Connect an ionization chamber to the SuperMAX to channel 1 (or channel 2 depending on mode selection) and select the desired voltage bias from the pull down menu. Allow at least 10 minutes for the system to stabilize.

NOTE: Depending on the type of measurements performed, leakage currents within the ionization chamber can be a significant portion of the measured data. Verify the leakage of the ionization chamber is within the manufacturer's stated acceptable limits. The system zero can be adjusted to compensate for leakage currents of the ionization chamber by pressing the Zero button after the chamber has been connected and the system has warmed up. Refer to page 8 for more information on system zeroing.

7. Press the Zero button to perform the system zero adjustment, but now with the ionization chamber connected (see page 8). This will take approximately 30 seconds to complete.

8. Check the system leakage. Take a reading without exposing the chamber to radiation. This reading should be less than 0.1% of the final signal expected.

9. Measure the atmospheric temperature and pressure.

10. Optionally, a chamber coefficient/system factor can be automatically applied to the measurement to calculate dose or dose rate. Check the box labeled "Apply System Factor" (see page 10), and a prompt appears to select a chamber from the Chamber Library (see page 13). If a system factor is not desired, skip to step 12.

    If "Apply System Factor" is selected, the following algorithm is used to calculate the dose or dose rate:

    Dose or dose rate = $P_{elec}NM_{raw}$, where:

    P_{elec} = Electrometer calibration factor, entered on the Calibration Tab within Preferences (see page 21). Note that P_{elec} should be set at the value of 1.000 if the electrometer and ion chamber are calibrated as a unit.
    N = Ion chamber calibration coefficient, entered in the Chamber Library (see page 14)
    M_{raw} = Raw, uncorrected ion chamber reading

NOTE: To select a chamber, it must first be set up within the Chamber Library (see page 13).

11. If a system factor is applied, the SuperMAX can also automatically correct radiological measurements for temperature and pressure. Check the box labeled "Apply T/P Correction" (see page 10) and the fields below will become enabled. A keypad will appear to enter both the appropriate temperature and pressure values.

    If "Apply T/P Correction" is selected, the following algorithm is used to calculate the dose or dose rate, and a blue icon reading ADC (Air Density Corrected) is shown in the upper left of the screen:

    Dose or dose rate = $P_{TP}P_{elec}NM_{raw}$, where:

    P_{TP} = Temperature-Pressure correction factor*
    P_{elec} = Electrometer calibration factor, entered on the Calibration Tab within Preferences (see page 21). Note that P_{elec} should be set at the value of 1.000 if the electrometer and ion chamber are calibrated as a unit.
    N = Ion chamber calibration coefficient, entered in the Chamber Library (see page 14)
    M_{raw} = Raw, uncorrected ion chamber reading

    *The following algorithm is used to calculate P_{TP}:

    P_{TP} = ((273.15 + *T(°C)*)/295.15) x (760/*P(Torr)*) for standard conditions of 22°C and 760 Torr

Or

P_{TP} = ((273.15 + *T(°C)*)/293.15) x (760/*P(Torr)*) for standard conditions of 20°C and 760 Torr

NOTE: Calibration coefficients provided by an ADCL are corrected to standard temperature and pressure (In the US, this is 22 °C and 760 Torr), and a correction for air density via a temperature/pressure correction must be applied to clinical measurements to obtain the correct air kerma strength for the source.

NOTE: Temperature/pressure correction is only applied to radiological units. It is not applied to electrical units.

12. Turn on or insert the radiation source(s) and take at least three measurements. For further explanation of the Rate Measurement, Timed, Continuous and Triggered Charge Collection modes, see page 8.

NOTE: Rate measurements above 500.0 nA (High range) or 500.0 pA (Low range) will produce X's in place of measurement values signifying overload has occurred.

13. Analyze the data taking into account the average of the readings, system leakage, temperature/pressure corrections, calibration factors and any other appropriate corrections to be made.

13. When measurements are completed, set bias voltage to 0 VDC (see page 8), turn off the SuperMAX and disconnect the ionization chamber.

14. If desired, disconnect the power supply from the SuperMAX and disconnect the detachable AC power cord from the power supply.

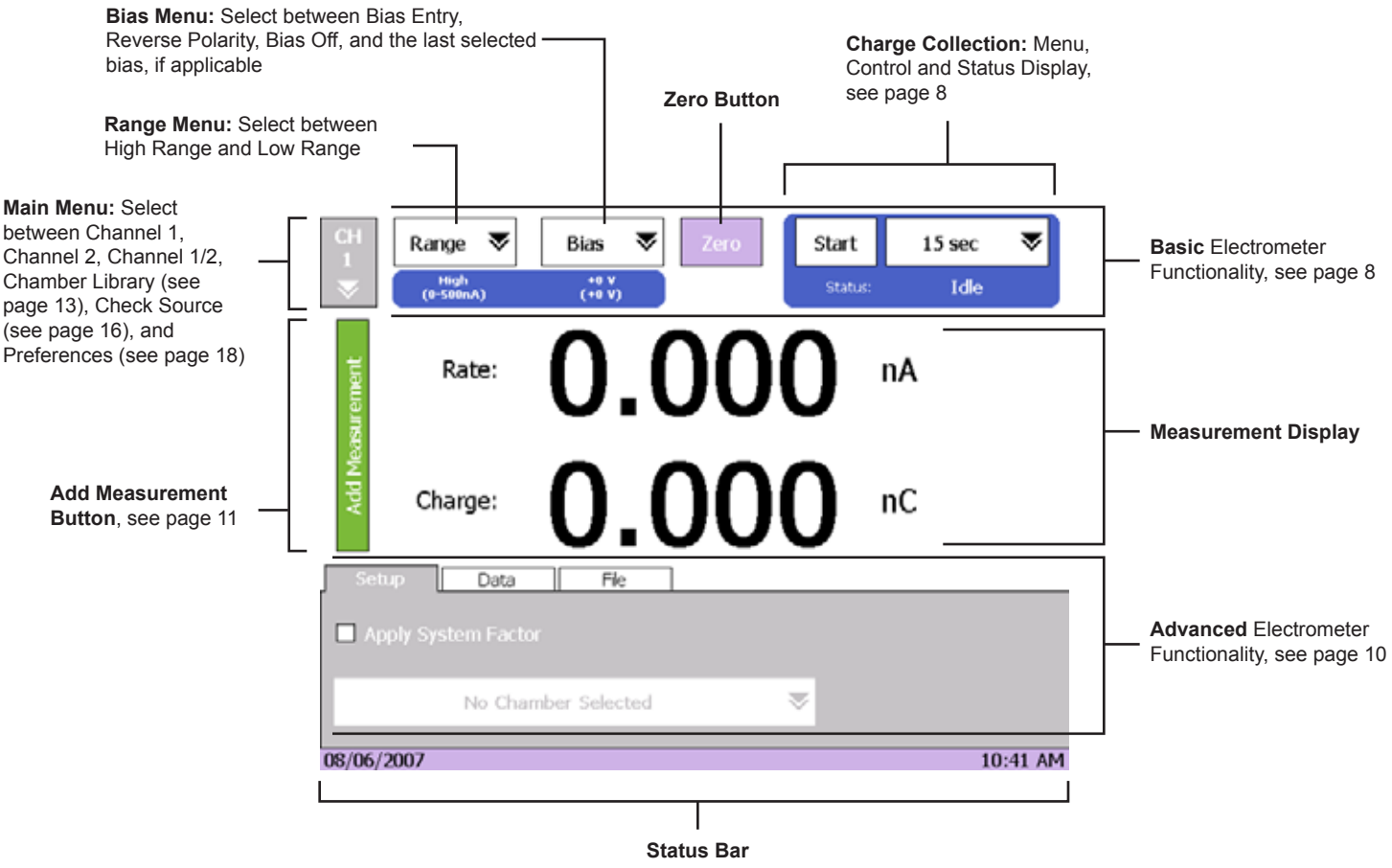
Measurement Interface - Introduction

After the splash screen, the SuperMAX measurement interface appears and displays Channel 1.

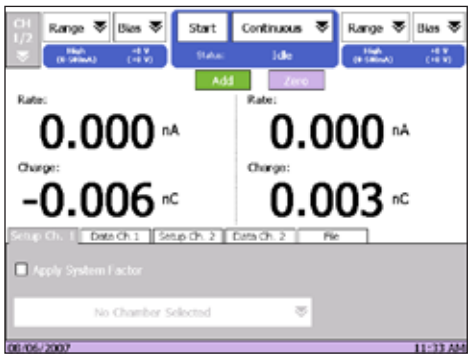
This section of the manual covers operation when using Channel 1, but operation using Channel 2 or Channels 1/2 Mode is similar with minor exceptions which will be noted in the following sections.

Shown below is a basic description of the measurement interface. The screen is broken up into three major sections: basic functionality, advanced functionality, and the measurement display.

Read the following pages for a description of each SuperMAX function.



The Channel 2 view is similar to Channel 1, except for the blue background for easy identification

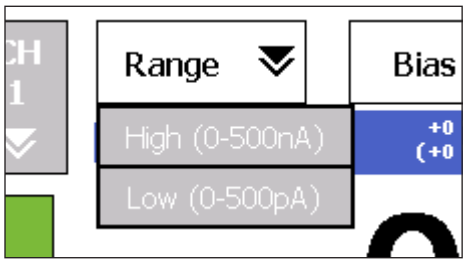


The Channel 1/2 operation is similar to either single channel display, but charge collection modes, the File tab, and the Add button are combined

Basic Functionality

The commands covered in this section explain how to the use the SuperMAX as a traditional electrometer to perform basic Rate and Charge measurements.

Range Menu



Tap on the range menu to reveal two options:

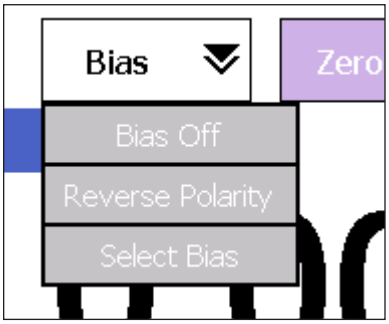
- High Range: 0-500 nA
- Low Range: 0-500 pA

Tap the desired range, and the SuperMAX will automatically switch range modes.

NOTE: Each range of operation must be zeroed upon initial use. To perform subsequent zero adjustments, press the Zero button.

NOTE: When in Channel 1/2 mode, range can be set independently for each channel.

Bias Menu



Tap on the bias menu to reveal three options:

- Bias Off: Bias is set to 0 V.
- Reverse Polarity: Quickly switch from positive to negative or negative to positive
- Select Bias: Use the on-screen numeric pad to select bias in 1 volt increments from ± 100-1000 V. Optionally, select between three discreet bias settings: ± 150, 300 or 450 V.

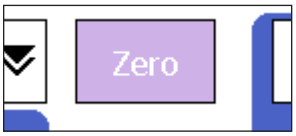
If changing the bias from a previously entered voltage, a fourth option will appear showing a quick selection of that previous value.

Using the previous selected bias option easily facilitates switching between two voltages for 1/3 or 1/2 bias ratio measurement.

Below the bias menu, two values are shown. The top value is the bias selection, while the bottom value in parenthesis is the actual bias reading. This design allows visibility of the actual bias as it settles into the desired value. While this settling occurs, the value will show with yellow characters. When the bias reading has settled within 2% of the bias selection, the characters will revert back to white characters.

NOTE: When in Channel 1/2 mode, bias can be set independently for each channel.

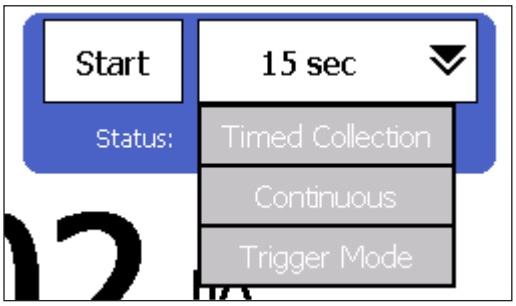
Zero Button / System Zeroing



Tapping this button performs a SuperMAX zero on the channel being displayed. It is advised to perform a zero when switching range, and connecting or disconnecting an ion chamber from the electrometer.

NOTE: The zero button only performs a zero on the currently viewed channel. For example, pressing zero when only channel 1 is displayed will not zero channel 2. To perform a zero on both channels simultaneously, browse to Channel 1/2 from the main menu and press the zero button.

Charge Collection



Tap on the charge collection menu to reveal three options:

- Timed Collection: When selected, a numeric keypad appears and a time value can be entered in 1 second increments from 1 to 600 seconds. Tap Start to perform a charge collection for the duration entered. Tap Stop to end the collection prematurely.

- Continuous: When selected, 0 sec will be displayed on the charge collection menu. Tap Start to begin a charge collection. Tap Stop to end the charge collection after the desired duration has passed.
- Trigger: This mode allows the SuperMAX to automatically detect the start and stop of a radiation exposure by measuring the current crossing predetermined limit triggers. When Trigger is selected, tap Start to ready the electrometer for measurement. When signal exceeds the Trigger Start value (set in Preferences, see page 21), charge collection will begin. When signal exceeds the Trigger Stop value (set in Preferences, see page 21), charge collection will end. Tap Stop to disarm the trigger mode.

  NOTE: Trigger mode is only available for Channel 1 (within either Channel 1 or Channel 1/2 modes). While still taken on Channel 2 when a trigger occurs, measurements are always triggered off of Channel 1. As such, Trigger does not appear as an option within the Channel 2 mode charge collection menu.

When any charge collection is completed, the measured value is placed in the Add List for future data export. To learn more about the Add List, see page 11.

NOTE: When in Channel 1/2 mode, charge collection is synchronized for both channels. However, resulting measurement values are kept separate. Also, when the SuperMAX is in Channel 1 or Channel 2 modes (single channel), charge collection is simultaneously measured on both channels independent of which channel is displayed.

Advanced Functionality

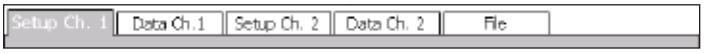
The commands covered in this section explain how to the use the SuperMAX to apply system factors and temperature/pressure corrections to measurements as well as export collected data to a USB flash drive.

The Setup, Data, and File tabs located on the bottom of the measurement screen are explained in this section.

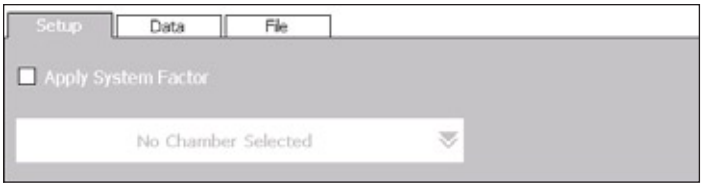
When in Channel 1 or Channel 2 mode, only a single Setup and Data tab appears for the channel currently displayed. When in Channel 1/2 mode, a unique Setup and Data tab appear for each channel as shown below. There is only one File tab, as all measurement data for both channels is exported simultaneously.

Channel 1 or Channel 2 Mode

Channel 1/2 Mode

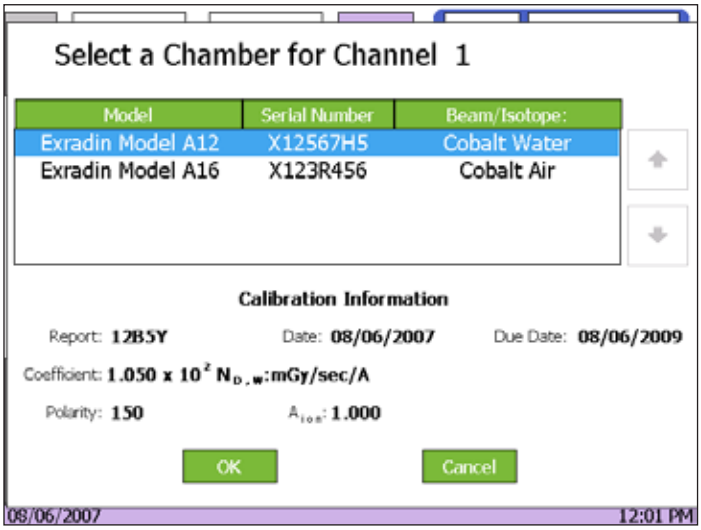


Setup Tab



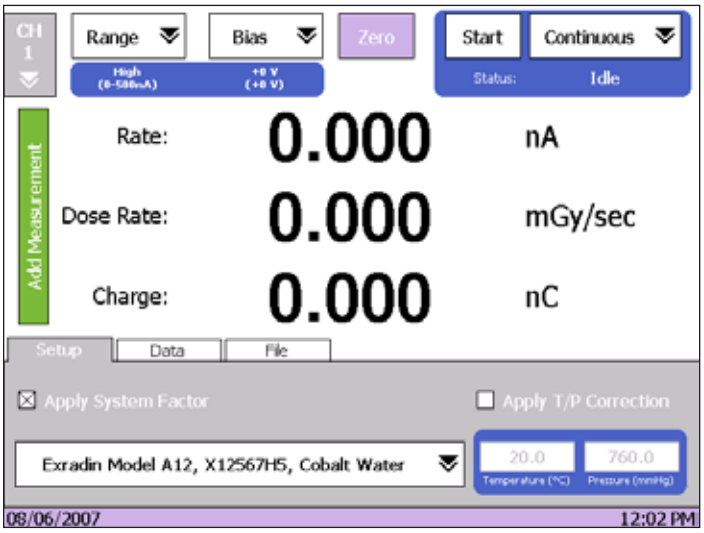
Applying a System Factor

Tap Apply System Factor to bring up the Select a Chamber window.



<u>NOTE</u>: There must be a chamber entered into the Chamber Library in order to apply a system factor. For an explanation of the Chamber Library interface, see page 13.

Tap the desired chamber and tap OK to return to the measurement interface. The chamber selected is shown on-screen along with an additional measurement display. In the following screen, Dose Rate has been added as a result of the system factor applied.



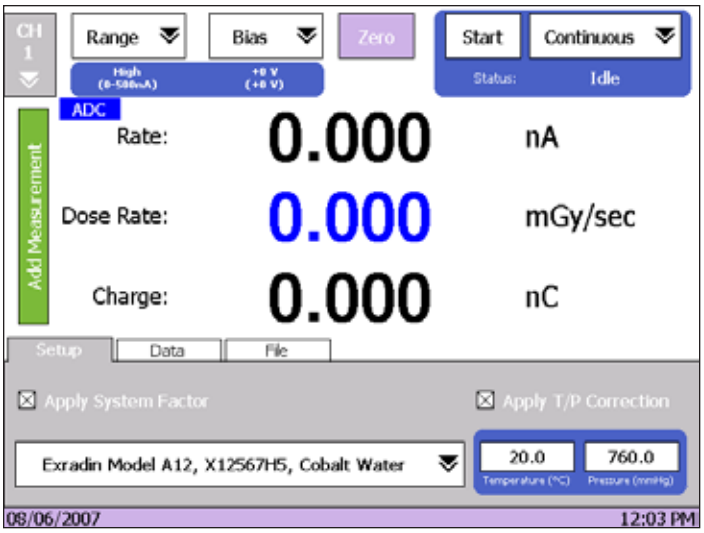
Depending on the units selected during the New Chamber wizard (see page 13), the measurement display will show either of the following:

- Rate, Dose Rate, Charge
- Rate, Charge, Dose

These values are calculated and shown in real-time as measurements are performed.

Applying Temperature/Pressure Correction

When a system factor has been applied, the ability to Apply T/P (Temperature/Pressure) Correction appears within the setup tab. Tap Apply T/P Correction to enable the values shown within the blue field.



The corrected value is shown in blue text on the measurement display. A blue icon reading ADC (Air Density Corrected) is also shown to call attention to this correction.

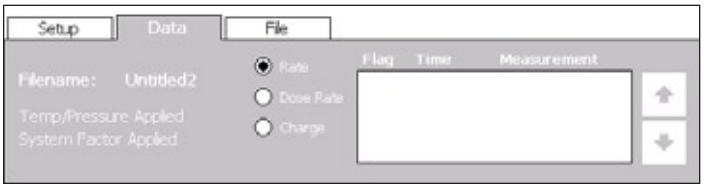
NOTE: Temperature/pressure correction is only applied to radiological units. It is not applied to electrical units.

If there is no pre-existing temperature or pressure entry, the numeric keypad will automatically display for supplying temperature and pressure values.

To modify an existing value, tap the appropriate number shown to display a numeric keypad. Enter the current value and tap OK to proceed.

NOTE: The SuperMAX does not automatically measure ambient temperature and pressure values nor does it display a prompt to verify if temperature and pressure values have changed over a certain period of time, so ensuring entered values are correct for the entire duration of measurement is recommended. If temperature or pressure values shift over time, adjust the values as described above.

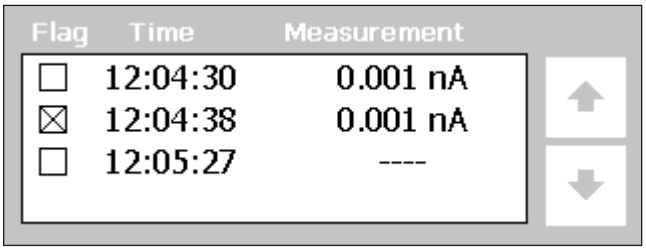
Data Tab



The Add List

The Data tab facilitates the creation of a list of measurement data points which can be exported from the SuperMAX. This list is called the Add List.

The Add List consists of a table of measurement data containing the time the measurement was completed and the value, with units, of that measurement. Additionally, the table contains a Flag column, which allows specific measurement points to marked or flagged for any reason. To mark a measurement value, tap the check box next to the corresponding measurement value.



The radio-type buttons to the left of the Add List allow browsing of captured measurement data of any type. If no system factor is applied, only Rate and Charge radio buttons will be available. When a system factor is applied, Dose Rate or Dose radio buttons will be also shown depending on the parameters of the system factor applied.

Adding Measurement Data to the Add List

It is not necessary to use the radio buttons to view the data type for which data is being added. Rate, dose rate, charge, and dose measurement values will be added to the appropriate field automatically.

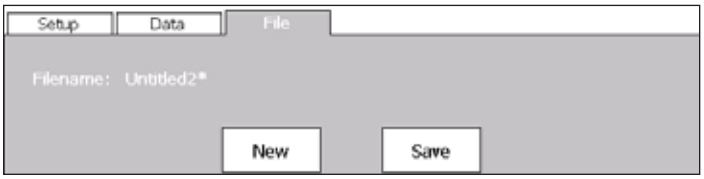
- **Adding a Charge or Dose Measurement**
  Whenever a charge collection (timed, continuous, or trigger) is completed, the resulting charge and/or dose measurement value is automatically added to the Add List.

- **Adding a Rate or Dose Rate Measurement**
  Rate and dose rate are values are added manually with the Add Measurement button (or Add Button, abbreviated for space in Channel 1/2 mode) described below.

Tapping this button adds the currently displayed rate and/or dose rate measurement to the Add List.

NOTE: When in any mode (Channel 1, Channel 2, Channel 1/2), tapping the Add Measurement or Add button will add rate measurement data to both of the channel Add Lists.

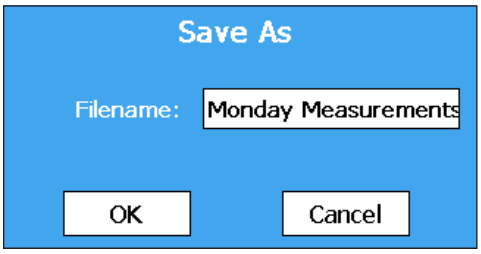
File Tab



The File tab allows for the export of measurement data that appears on the Add List. Operation is similar to that of popular word processing programs. Shown on the tab is the name of the current working file, as well as New and Save buttons. If the file has not been previously saved, the name “untitled” appears. A star (*) is shown as a suffix if new data has been added to the Add List since the last save occurred.

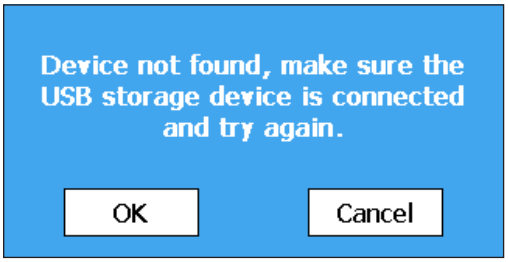
Saving Data

Before attempting to save a file, connect a USB flash drive to one of the two available USB ports on the SuperMAX. Tap the Save button to bring up the following prompt.



Tap the file name box to bring up an on-screen keypad for file name entry. Tap in the desired file name and tap OK to continue. If the save operation was successful, the file name entered will be displayed on the file tab, and .CSV will be written to the USB flash drive.

NOTE: The following error may occur:



Some USB flash drives may take up to 15 seconds to register with the SuperMAX software. Ensure the USB flash drive is connected properly and wait a brief moment before attempting to save again. Also try to unplug and re-plug the USB flash drive from the SuperMAX. If the USB flash drive is plugged into the SuperMAX before the device is turned on, it may not be recognized by the software. If two USB flash drives are attached to the SuperMAX, only the first drive attached will be recognized.

Subsequent save operations are performed by tapping the save button. If the save operation is successful, the star (*) will disappear from the end of the file name.

NOTE: When saving a file, measurement data from both channels will be saved regardless of which mode (Channel 1, Channel 2, Channel 1/2) the SuperMAX is set to. For example, if compiling measurement data when in the Channel 1 mode Add List, this data will still be shown on the “Data Ch. 1” tab when switching to Channel 1/2 mode.

For an explanation of the exported file format, see page 24.

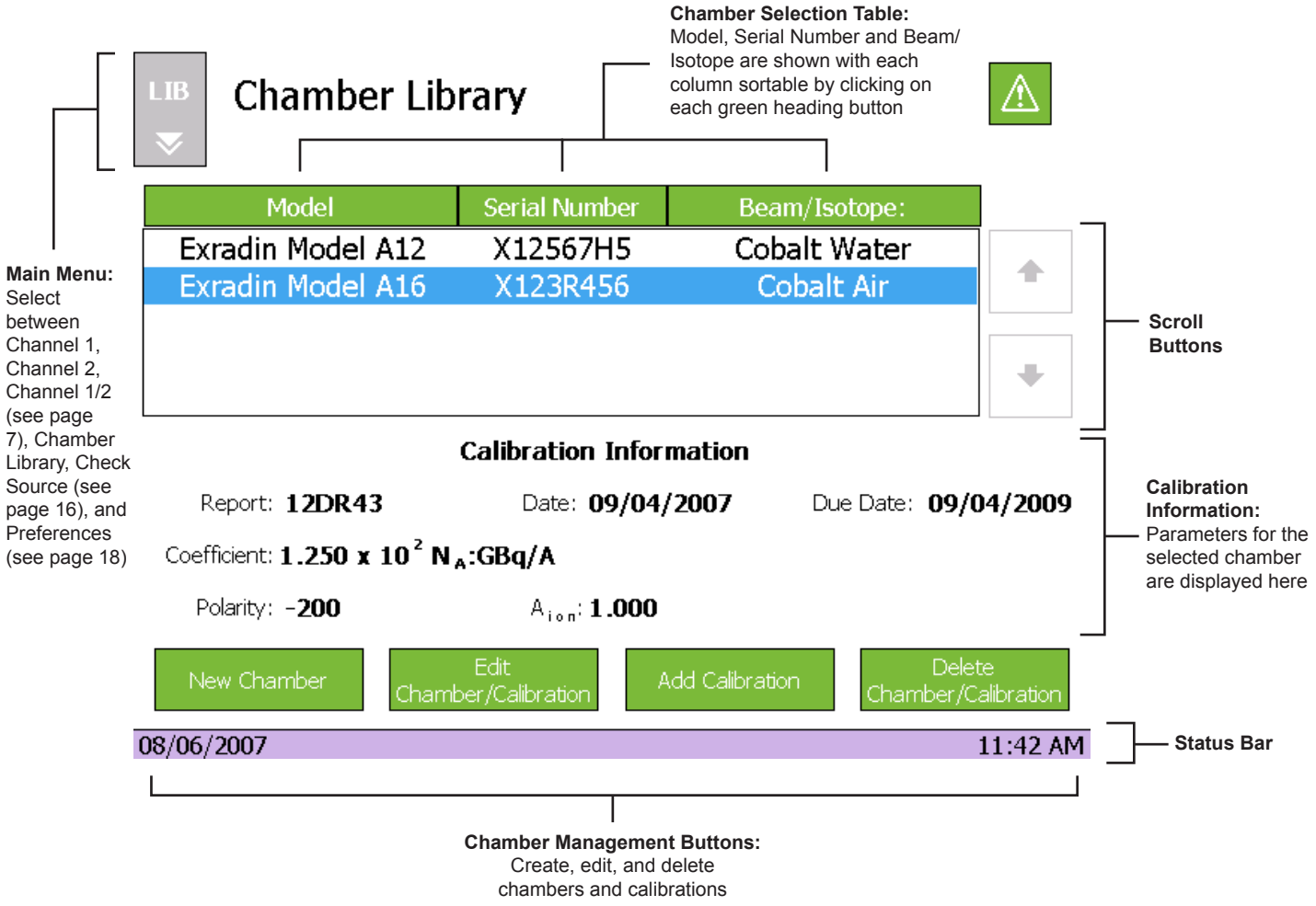
Starting a New File

To clear the Add List and start a new measurement data file, tap the New button. If the Add List contains un-saved data, a prompt will display with the option to save this data before continuing. A new untitled file will be started with an empty Add List within the Data tab.

Chamber Library

The Chamber Library allows for adding system factors by way of chamber calibration data into the SuperMAX interface. Most types of ionization or well chambers can be used, and multiple calibrations for individual chambers can be entered for additional flexibility.

The Chamber Library is accessed through the main menu in the top left corner of the SuperMAX interface. This section of the manual covers adding, editing and deleting of chambers within the interface.



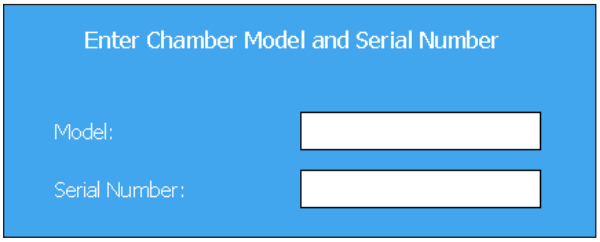
Adding a New Chamber

Tap the New Chamber button to begin the New Chamber Wizard. This wizard will walk through the steps needed to add a chamber to the Chamber Library.

NOTE: Before adding a new chamber, a password must be entered to help prevent inadvertent changes. This password is 3120.

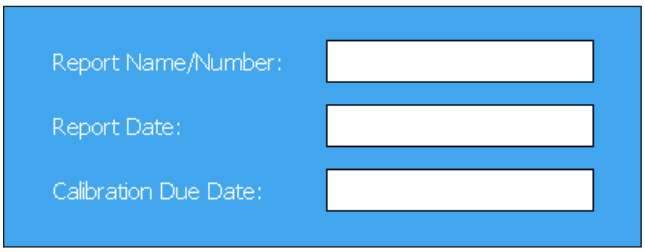
Step 1: Chamber Model and Serial Number

The first screen prompts for the chamber model and serial number. Tap each entry box to display a on-screen keypad, allowing entry. Once the fields have been completed, tap Next to continue the wizard.

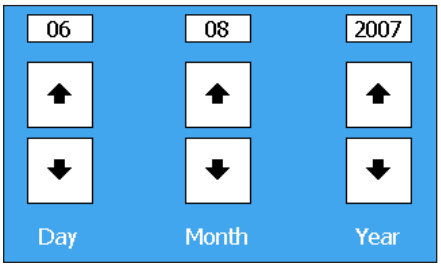


Step 2: Calibration Report Information

Next, calibration report information is required. Enter the report name or number listed on the calibration document along with the date of the report/calibration.



When entering the report date, the date selection tool shown below will be displayed.



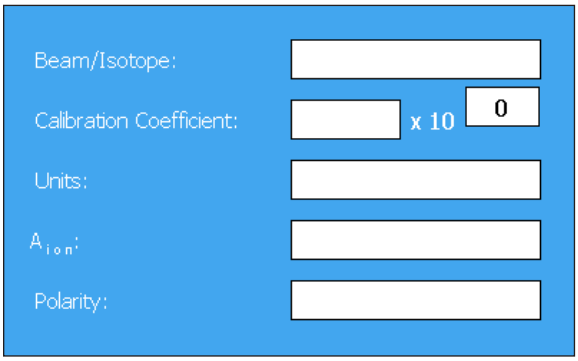
Once this date is entered, the calibration due date is automatically filled in, with a date two years following the report date. This value can be changed by clicking on the calibration due date field, but ionization or well chamber calibration is recommended every two years by the AAPM TG-51 protocol.

<u>NOTE</u>: If a chamber is within 60 days of needing a calibration, an icon (▼) will show next to the chamber name on the main chamber library screen. Additionally, a message will appear on the SuperMAX splash screen indicating a calibration may be soon or past due.

Tap Next to continue the wizard.

Step 3: Chamber Calibration Information

The chamber calibration information is next. Beam/Isotope, A_{ion} and polarity values have no bearing on the calculated system factor, and are provided for the convenience of identifying the calibration. However, the calibration coefficient, units, are needed for the calculation of the system factor.



All of these values are entered via on-screen keypad except for units, which is selected from a pre-set list of options via a pull down menu as shown to the right.

Verify that the selected default units match the reported units of the calibration factor and adjust the exponent if needed.

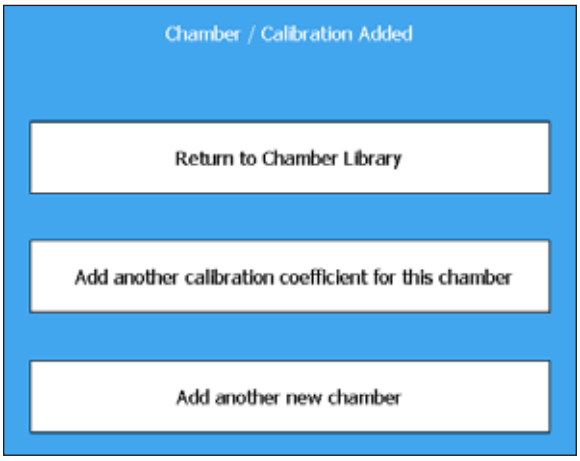
Tap Next to continue the wizard.

- N_{sk}:µGym²/hA
- N_{sk}:Gym²/hA
- $N_{x,sk}$:Rm²/hA
- N_A:GBq/A
- N_A:Ci/A
- $N_{D,W}$:µGy/sec/A
- N_A:MBq/A
- N_A:µCi/A
- N_k:Gy/C
- N_x:R/C
- N_{Gas}:Gy/C
- N_D:Gy/C
- $N_{D,W}$:Gy/C

Step 4: Review

The next screen will show a summary of all chamber parameters for review. If necessary, tap Back to navigate through the wizard and make any changes, or tap Finish to register the chamber in the Chamber Library.

At this point, additional options are displayed allowing for return to the Chamber Library, adding another calibration for the new chamber, or adding another new chamber altogether.


Chamber / Calibration Added
Return to Chamber Library
Add another calibration coefficient for this chamber
Add another new chamber

When adding another calibration coefficient for the new chamber, the wizard will return to step 2 with the chamber model and serial number already completed. Adding another new chamber will restart with wizard from the beginning.

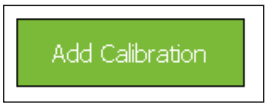
Editing an Existing Chamber/Calibration

To edit an existing chamber or calibration, select it from the Chamber Library main screen and tap the Edit Chamber/Calibration button.

NOTE: Before editing a chamber or calibration, a password must be entered to help prevent inadvertent changes. This password is 3120.

A wizard identical to the new chamber wizard will appear with all chamber and calibration parameters filled in. Step through the wizard editing the desired parameters and once completed, the chamber and calibration information will be saved to the Chamber Library.

Adding a Calibration to an Existing Chamber



To add a calibration to an existing chamber, select it from the Chamber Library main screen and tap the Add Calibration button.

NOTE: Before adding a calibration, a password must be entered to help prevent inadvertent changes. This password is 3120.

A wizard identical to the new chamber wizard will appear beginning at step 2 with the chamber model and serial number already completed. Step through the wizard to create an additional calibration and once completed, the new calibration information will be saved to the Chamber Library.

Deleting an Existing Chamber/Calibration

To delete a chamber or calibration, select it from the Chamber Library main screen and tap the Delete Chamber/Calibration button. A prompt will appear to confirm this operation.

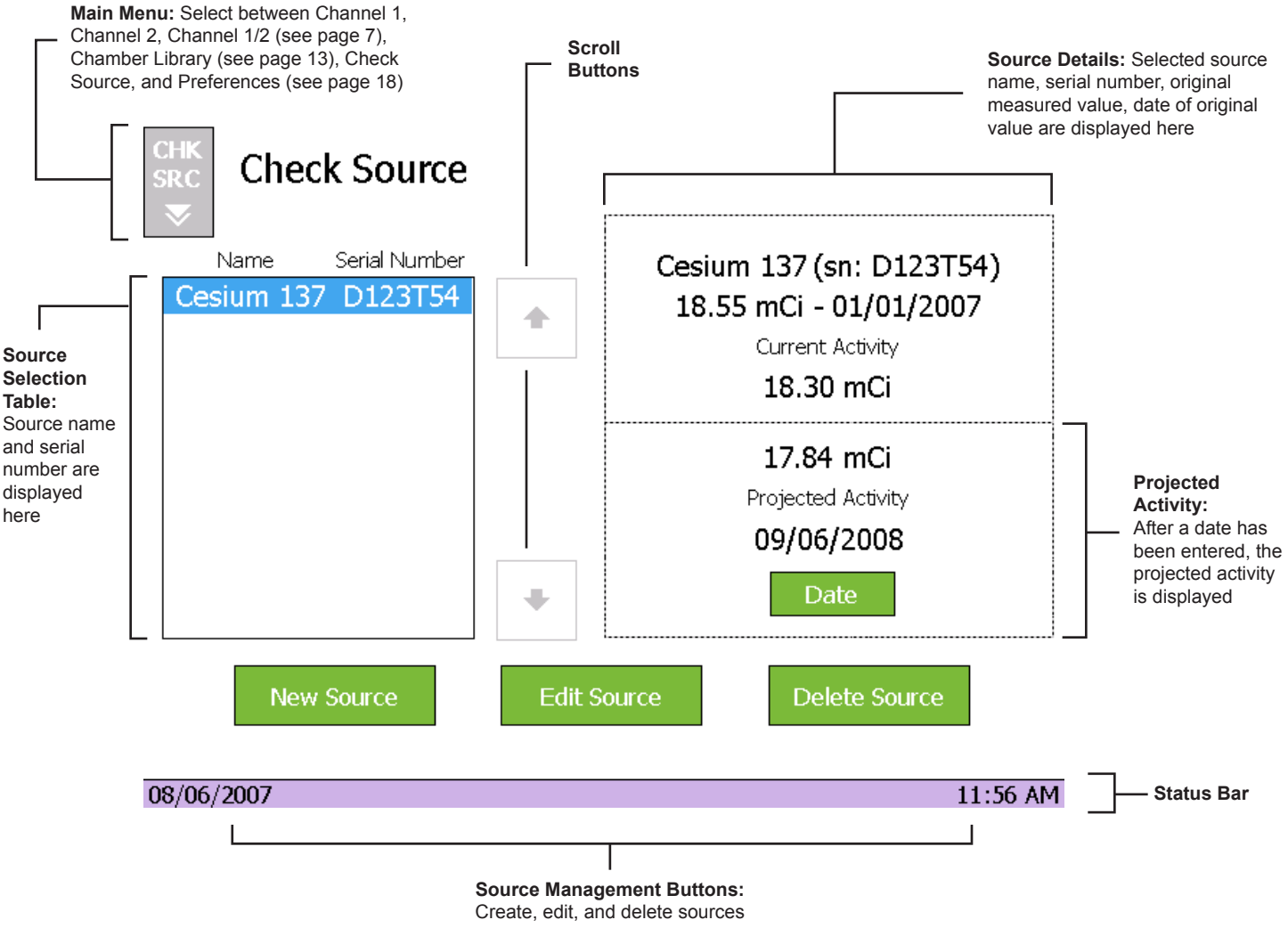
NOTE: Before deleting a chamber or calibration, a password must be entered to help prevent inadvertent changes. This password is 3120.

Each item in the Chamber Library list is a separate entity, meaning if multiple calibrations exist for an individual chamber, all calibrations must be deleted separately to completely remove a chamber from the chamber library.

Check Source

Check Source is a simple utility for creating a source database and calculating the projected activity of a radiation source. This utility is separate from the measurement and chamber library modes within the SuperMAX.

Check Source is accessed through the main menu in the top left corner of the SuperMAX interface. This section of the manual covers adding, editing and deleting sources as well as calculating the projected activity of radiation sources.

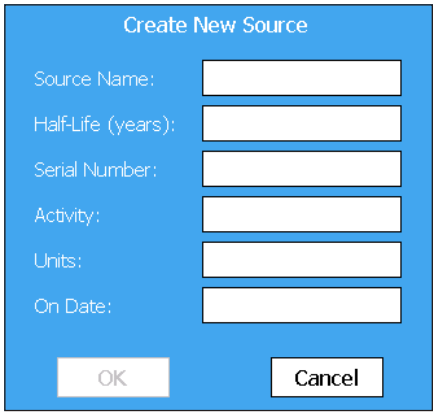

Main Menu: Select between Channel 1, Channel 2, Channel 1/2 (see page 7), Chamber Library (see page 13), Check Source, and Preferences (see page 18)
CHK SRC
Check Source
Scroll Buttons
Source Details: Selected source name, serial number, original measured value, date of original value are displayed here
Name
Serial Number
Cesium 137 D123T54
Cesium 137 (sn: D123T54)
18.55 mCi - 01/01/2007
Current Activity
18.30 mCi
17.84 mCi
Projected Activity
09/06/2008
Date
Source Selection Table: Source name and serial number are displayed here
Projected Activity: After a date has been entered, the projected activity is displayed
New Source
Edit Source
Delete Source
08/06/2007
11:56 AM
Status Bar
Source Management Buttons: Create, edit, and delete sources

Adding a New Source

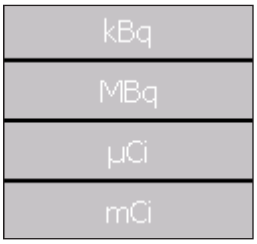
Tap the New Source button to display the Create New Source form. Complete the fields on this form to add a new source to the Check Source database.

NOTE: Before adding a new source, a password must be entered to help prevent inadvertent changes. This password is 3120.

Source Name, Half-Life, Serial Number and Activity are all entered via an on-screen keypad while Units are entered via a pull-down menu and On Date is selected via the date selection tool.



Shown below is the list of units available:



The values on this form are the basis for the projected activity calculation. When completed, tap the OK button and the new source is added to the Check Source database.

Editing an Existing Source

To edit an existing source, select it from the Check Source main screen and tap the Edit Source button. Make any desired changes and tap the OK button to save the changes to the database.

NOTE: Before editing a source, a password must be entered to help prevent inadvertent changes. This password is 3120.

Deleting an Existing Source

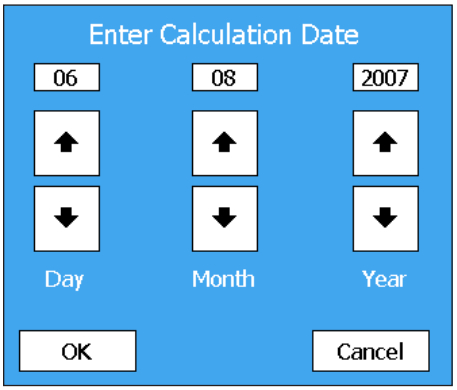
To delete a source, select it from the Check Source main screen and tap the Delete Source button. A prompt will appear to confirm this operation.

NOTE: Before deleting a source, a password must be entered to help prevent inadvertent changes. This password is 3120.

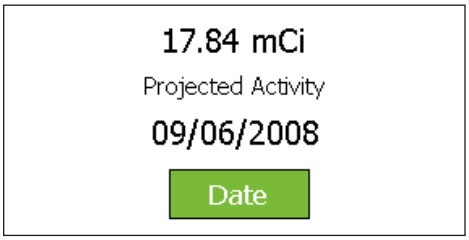
Calculating Projected Activity

To calculate a source's projected activity, select it from the Check Source main screen. The source parameters are displayed on the upper right portion of the screen. Tap the Date button.

The date selection tool is displayed.



The activity value can be calculated to either a future or past date. Enter the desired date and tap the OK button to continue. The projected activity is shown on the main Check Source screen.



NOTE: The calculated activity value is only displayed for reference and is not saved.

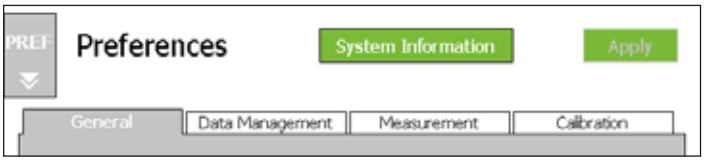
NOTE: The following algorithm is used to calculate the activity of a check source:

$A = A_o e^{-Lt}$, where:

A = Activity on chosen date
A_o = The original activity of the check source on the reference date (On Date)
L = (0.693/half-life of the isotope in years)
t = Elapsed time, in years, calculated from the difference between the reference date (On Date) and the current or projected date

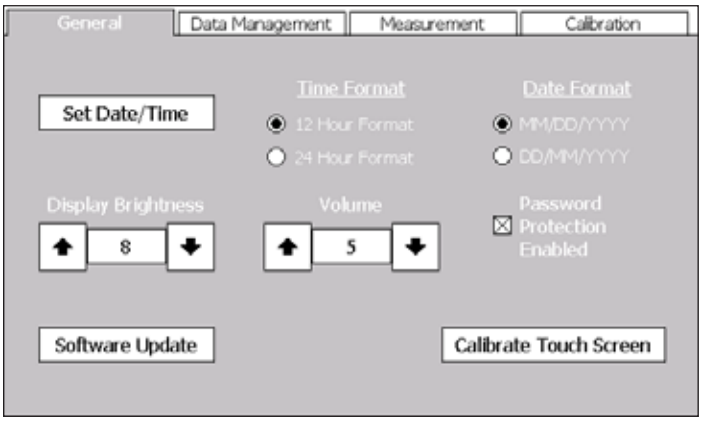
To access and change SuperMAX preferences, select Preferences from the main menu. The Preferences section is split into four main tabs: General, Data Management, Measurement and Calibration. In addition, the SuperMAX software, firmware and OS build/version numbers can be accessed by tapping the System Information button.

Once changes are made to any preference, the Apply button becomes enabled. Tap the Apply button to save any changes made. If the Apply button is not tapped, a prompt will display upon leaving the Preferences section to save or discard any changes made.



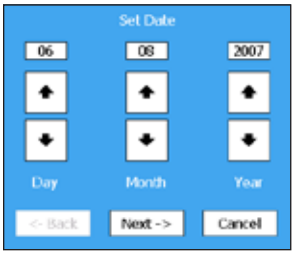
This section of the manual will explain the preferences settings in each of the four main tabs.

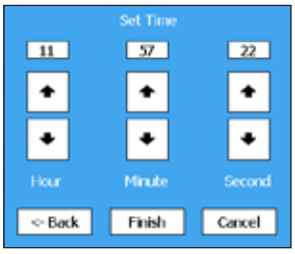
General Preferences



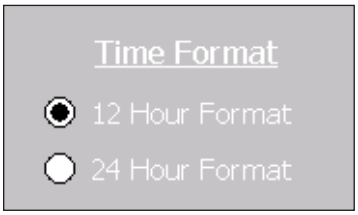
Setting Date and Time

Tap the Set Date/Time button to display the date selection tool. Enter the current date and tap Next. The time selection tool is displayed. Enter the current time and select finish to complete the change. The changes made will be displayed in the status bar along the bottom of the screen.



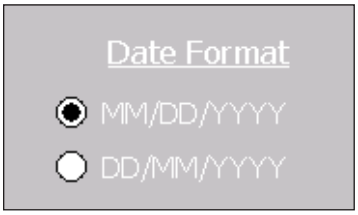


Time Format



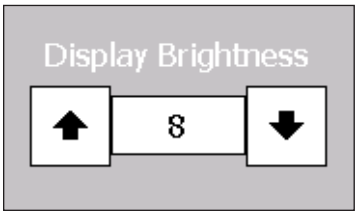
Select the desired time format by taping the radio button adjacent to either 12 Hour Format or 24 Hour Format.

Date Format



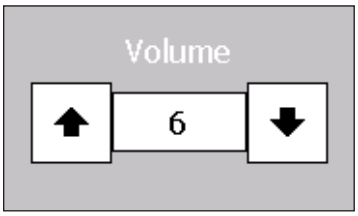
Select the desired date format by tapping the radio button adjacent to either MM/DD/YYYY (Month/Day/Year) or DD/MM/YYYY (Day/Month/Year).

Display Brightness



Tap the up and down arrow buttons to adjust the display from dimmer (lower number) to brighter (higher number).

Sound Volume



Tap the up and down arrow buttons to adjust the sound volume from softer (lower number) to louder (higher number).

A sound will play upon each change to signify the new volume level.

Password Protection

Certain function such as the Chamber Library are password protected to prevent inadvertent changes. If you wish to turn off this protection, tap the checkbox adjacent to Password Protection Enabled.

NOTE: To change this option, a password must be entered. This password is 3120.

Software Update

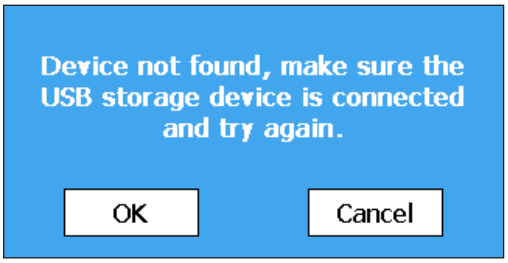
Before initiating a software update, use a PC to place a new SuperMAX software update into the root directory of a USB flash drive.

Insert this flash drive it into one of the two available SuperMAX USB ports.

Tap the Software Update button to begin the update process. The following dialog box will display:

If the update file is found successfully, the SuperMAX software will perform a system update.

NOTE: The following error may occur:



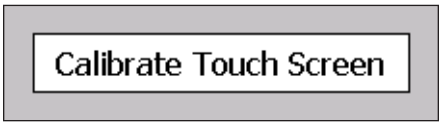
Some USB flash drives may take up to 15 seconds to register with the SuperMAX software. Ensure the USB flash drive is connected properly and wait a brief moment before attempting to perform the update again. Also try to unplug and re-plug the USB flash drive from the SuperMAX. If the USB flash drive is plugged into the SuperMAX before the device is turned on, it may not be recognized by the software. If two USB flash drives are attached to the SuperMAX, only the first drive attached will be recognized.

Upon completion of the this first part of the update, a dialog box will appear requesting for a cycle of power. Unplug the SuperMAX from its power adapter and re-plug it back in after waiting a few seconds.

IMPORTANT: Be certain to unplug the power adapter and not just turn the power off using the circular power button on the front of the SuperMAX.

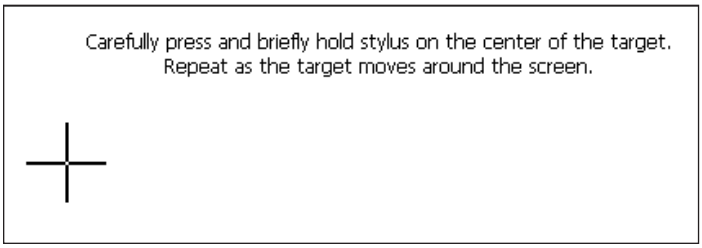
After re-plugging the power adapter, the display will be dark, but the green LED on the SuperMAX front label will blink green for up to 20 seconds. This is the SuperMAX software booting up. After this period, the SuperMAX software will launch and the update will be complete.

Touch Screen Calibration



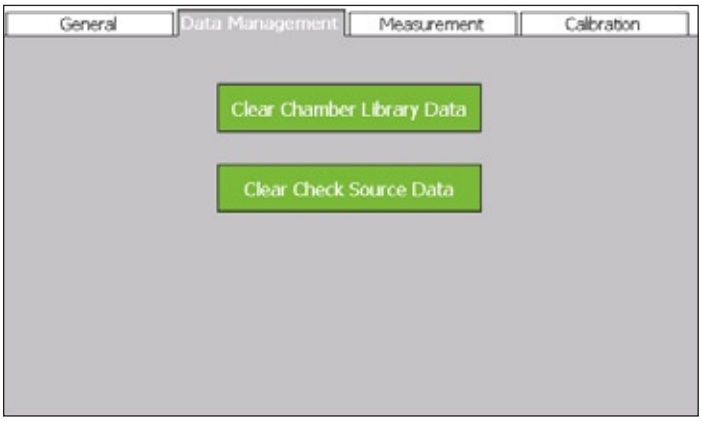
To perform a touch screen calibration, tap the Calibrate Touch Screen button. The calibration utility will be shown. Follow the instructions on-screen to complete the calibration process.

NOTE: While using the SuperMAX interface does not require use of a stylus, it is recommended to perform this process with one for greater precision.



When calibration is completed, tap the screen to save the new settings or wait as stated on screen to keep the previous values.

Data Management Preferences



Clear Chamber Library Data

To clear all Chamber Library data, tap the Clear Chamber Library Data button. A prompt will appear to confirm this operation.

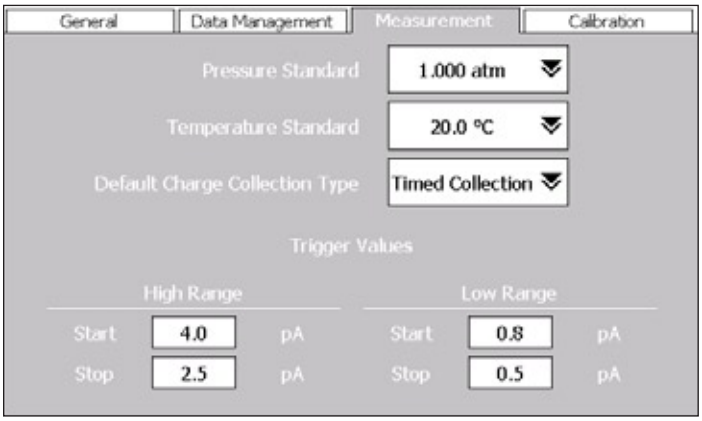
NOTE: Before clearing chamber library data, a password must be entered to help prevent inadvertent changes. This password is 3120.

Clear Check Source Data

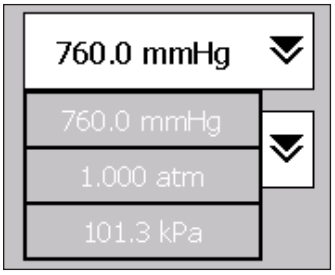
To clear all Check Source data, tap the Clear Check Source Data button. A prompt will appear to confirm this operation.

NOTE: Before clearing check source data, a password must be entered to help prevent inadvertent changes. This password is 3120.

Measurement Preferences



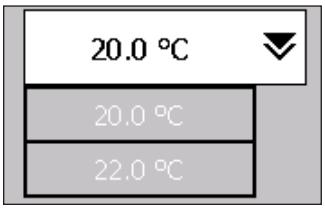
Set Pressure Standard



NOTE: Before changing the pressure standard, a password must be entered to help prevent inadvertent changes. This password is 3120.

Tap the Pressure Standard pull-down menu to display the available options. Tap the desired value to select it. Changing the pressure standard will clear the pressure value set on any measurement screen.

Set Temperature Standard



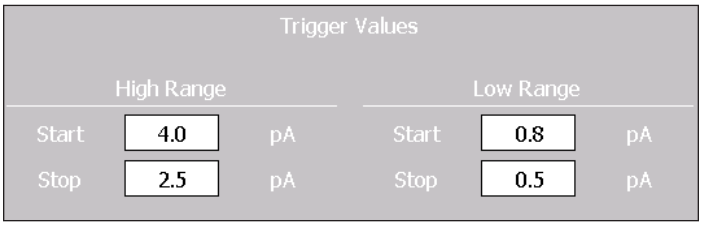
NOTE: Before changing the temperature standard, a password must be entered to help prevent inadvertent changes. This password is 3120.

Tap the Temperature Standard pull-down menu to display the available options. Tap the desired value to select it. Changing the temperature standard will clear the temperature value set on any measurement screen.

Set Default Charge Collection Type

Select between Timed, Continuous or Triggered Charge Collection modes. This preference will be applied to Channel 1, 2, and Channel 1/2 modes.

Set Trigger Values



Trigger values are adjustable for both the high and low range. The default settings are Start 4.0 pA and Stop 2.5 pA for high range, and Start 0.8 pA and Stop 0.5 pA for low range. These values are adjustable from 0.01 - 9.99 pA. Tap the Start or Stop value to edit each independently. Trigger values must be larger than 0.0, and the Start value must be larger than the Stop value.

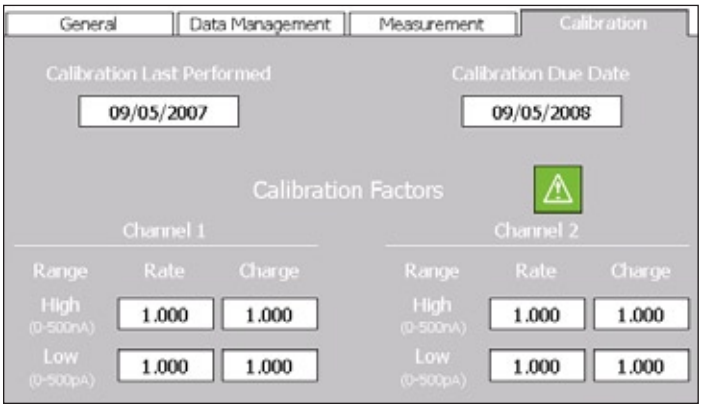
NOTE: Before changing trigger values, a password must be entered to help prevent inadvertent changes. This password is 3120.

When making measurements in the presence of larger leakage currents, it may be necessary to raise the trigger values. Conversely, since the start trigger value determines the minimum dose rate, it may be necessary to lower the trigger value for other measurements.

NOTE: Charge measurements made in modes other than those used by the calibration agency may result in measurement errors which exceed the calibration uncertainty.

After the password is entered, the Start and Stop values can be entered via an on-screen keypad.

Calibration Preferences



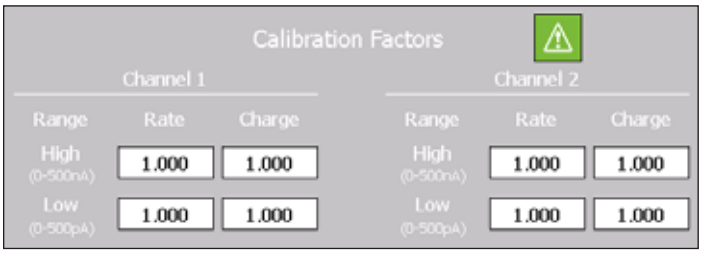
Calibration Last Performed / Calibration Date Due

These values can be entered from a calibration report for quick reference.

NOTE: If the SuperMAX is within 60 days of needing a calibration, an icon (▼CAL) will show next to the chamber name on the main chamber library screen. Additionally, a message will appear on the SuperMAX splash screen indicating a calibration may be soon or past due.

NOTE: Before changing these dates, a password must be entered to help prevent inadvertent changes. This password is 3120.

Calibration Factors



Calibration factor values received from a calibration agency for Channel 1 and 2, high range and low range can be entered here for added computational convenience.

Preferences Continued

NOTE: Before changing calibration factors, a password must be entered to help prevent inadvertent changes. This password is 3120.

NOTE: These factors are only applied to system factor corrected measurements, i.e. dose and dose rate. See page 10 to learn more about applying a system factor.

Electrical measurements, i.e. rate and charge, are always displayed as raw values and are not affected by these factors.

The default setting is 1.000 for each calibration factor. When the values are set to 1.000, essentially no factor is applied. Tap each value to enter it with the on-screen keypad.

For reference, the terminology used to develop the nomenclature within the SuperMAX software is based on ICRU Report No. 76:

Indication (of a measuring instrument) is the value of the quantity provided by a measuring instrument.

> *Note*: The value read from the displaying device can be called the direct indication; it is multiplied by the instrument constant to give the indication. The quantity can be the measurand, a measurement signal, or another quantity to be used in calculating the value of the measurand. For a material measure, the indication is the value assigned to it.

Instrument constant is the coefficient by which the direct indication of the measuring instrument must be multiplied to give the value of the measurand, or of a quantity to be used to calculate the value of the measurand.

Calibration coefficient is the quotient of the conventional true value of the quantity to be measured and the direct indication of the instrument normalized to the reference conditions. The calibration coefficient is equivalent to the *instrument constant* multiplied by the *calibration factor*.

Calibration factor is the factor by which the *indication* (*direct indication* multiplied by the *instrument constant*), of the device is multiplied to obtain the conventional true value of the quantity to be measured under reference conditions.

Troubleshooting

Questionable Readings
If readings are off, determine if there is any leakage from the SuperMAX or ionization chamber. Follow steps 1 - 7 under General Operation.

No Response
If the SuperMAX does not respond to any commands from the touch screen for more than 10 seconds, use the external reset switch to restart the unit. See page 4 for details.

Electromagnetic or Other Interference
If the SuperMAX causes or is affected by interference with other equipment, try to correct the interference by performing the following:

- Increase separation between equipment
- Connect the power supply power cord into a different grounded AC outlet or into a circuit controlled by a different circuit breaker.
- Consult Standard Imaging, Inc.

Cannot Detect USB Flash Drive
Some USB flash drives may take up to 15 seconds to register with the SuperMAX software. Ensure the USB flash drive is connected properly and wait a brief moment before attempting to perform the save or update operation again. Also try to unplug and re-plug the USB flash drive from the SuperMAX. If the USB flash drive is plugged into the SuperMAX before the device is turned on, it may not be recognized by the software. If two USB flash drives are attached to the SuperMAX, only the first drive attached will be recognized.

If you require further assistance, please contact Standard Imaging's Service Department at (800) 261-4446 or (608) 831-0025 for international calls. A list of frequently asked questions (FAQs) can be found on our website:

www.standardimaging.com

Parts and Accessories List

REF	Description
90018	SuperMAX Electrometer
80556	SuperMAX User Manual
72731	SuperMAX Power Supply
72730	Optional International Power Cord Set
72250	Optional SuperMAX Carrying Case
72245	Optional SuperMAX Accessory Kit (includes extra stylus, extra USB flash drive, and 5 extra screen protectors)
11426	Stylus
11444	USB Flash Drive
11443	LCD Touchscreen Protector, set of 5

Maintenance

As is standard practice for other electrometers, it is recommended that the SuperMAX be calibrated every 2 years. This calibration should be performed by an accredited dosimetry calibration laboratory (ADCL).

Exterior cleaning of the device can be done with a soft brush and a cloth. Gently brush all surfaces to remove dirt and dust. Remove any remaining dirt with a cloth slightly dampened with a solution of mild detergent and water or a liquid disinfecting agent. Do not use water or liquid on triax jacks. Do not permit any liquid to seep into the SuperMAX in any manner during cleaning. It is not recommended to clean the window of the LCD with anything other than a mild detergent and a very soft cloth. Failure to use a soft cloth may result in a scratched display, and this may impair the visibility of the LCD. Included with the SuperMAX is a pre-installed screen protector to help reduce screen wear. Replacement screen protectors can be ordered from Standard Imaging.

There are no user serviceable parts in the SuperMAX.

Sterilization of the SuperMAX is not required.

If assistance is desired in the proper disposal of this product (including accessories and components), after its useful life, please return to Standard Imaging.

Over the years, Standard Imaging has had product reports of drift or leakage involving its ion chambers, well chambers and electrometers. During the investigation and/or servicing of these products it became apparent a significant portion of these reports were caused by dirty triax connectors. The cause is typically dust that has collected on the inside connector.

To minimize these reports and unnecessary service, Standard Imaging is providing a triax connector cleaning procedure. This triax connector cleaning procedure should be periodically completed or whenever there are concerns of drift or leakage. Heavier product use may require more frequent cleanings.

Prior to cleaning a triax connector, ensure:
- The ion chamber or well chamber is disconnected from the electrometer.
- There is no water or moisture visible in the triax connector.

To clean a dirty triax connector:
- Remove the connector cap (if applicable).
- Use only a dry and oil free compressed air source, such as Chemtronics® Ultra Jet.
- Gently blow dirt and contaminants from the inside of the connector, moving the air source in a circular manner a few inches from the connector.

After cleaning a dirty triax connector:
- Use the connector cap when not in use (if applicable).

Do not:
- Use sharp objects to attempt to clean a dirty triax connector.
- Use a compressed gas other than air.
- Use a compressed gas source that may have moisture or oil in the source or lines.
- Use your mouth to blow on the connector.
- Disassemble the connector.
- Touch the internal parts of the connector with your finger.

If this procedure does not resolve the drift or leakage issues, contact the Customer Service Administrator to coordinate the return the product to Standard Imaging for further service.

If there are any questions or comments regarding this information, please contact Standard Imaging or your authorized dealer.

Description of Symbols

The following symbols are found on the SuperMAX Electrometer:

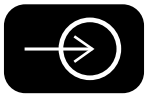
Power/Standby Button

Attention, Consult Accompanying Documents

Dangerous Voltage Present Inside Enclosure

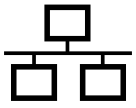
Reset

Power On



Signal Input

USB Port



Ethernet Port

Explanation of Saved File Export

When exporting data from the SuperMAX, the file type is a *.CSV file, (comma separated value), that can be directly opened with any spreadsheet application. The resulting file will have data labels as described below.

The structure of the file is split into three main sections: General Electrometer Information, Channel 1 Measurement Data, and Channel 2 Measurement Data.

General Electrometer Information:

Column	Data Label	Description
A (1)	SuperMAX	Identifies that this data is from the SuperMAX Electrometer
B (2)	Serial Number	SuperMAX serial number
C (3)	Last Cal Date	Date of last SuperMAX calibration
D (4)	Software Version	SuperMAX software version number
E (5)	Software Build	SuperMAX software build number
F (6)	Firmware Version	SuperMAX firmware version number
G (7)	OS Version	SuperMAX OS version number
H (8)	OS Build	SuperMAX OS build number

Channel 1 (or Channel 2) Measurement Data:

Column	Data Label	Description
A (1)	Flagged	(1 or 0) 1 is measurement point is checked in the Add List, 0 if not
B (2)	Date	Date when measurement was taken, in the format MM/DD/YYYY
C (3)	Time	Time when measurement was taken, in the format HH:MM:SS
D (4)	Rate	Rate value, if applicable
E (5)	Rate Unit	Rate unit of value in previous column, if applicable
F (6)	Dose Rate	Dose rate value, if applicable
G (7)	Dose Rate Unit	Dose rate unit of value in previous column, if applicable
H (8)	Charge	Charge value, if applicable
I (9)	Charge Unit	Charge unit of value in previous column, if applicable
J (10)	Dose	Dose value, if applicable
K (11)	Dose Unit	Dose unit of value in previous column, if applicable
L (12)	Range	(high or low) Range setting at time of measurement
M (13)	Bias (VDC)	Bias setting at time of measurement
N (14)	T/P Correction	(1 or 0) 1 if T/P correction is enabled at time of measurement, 0 if not
O (15)	Temperature	Temperature setting at time of measurement
P (16)	Pressure	Pressure setting at time of measurement
Q (17)	Temperature Standard	Temperature standard at time of measurement
R (18)	Pressure Standard	Pressure standard at time of measurement
S (19)	Timed	(1 or 0) 1 if measured value is from a timed charge collection, 0 if not
T (20)	Duration (sec)	Duration of timed charge collection, if applicable
U (21)	Continuous	(1 or 0) 1 if measured value is from a continuous charge collection, 0 if not
V (22)	Elapsed (sec)	Duration of continuous charge collection, if applicable
W (23)	Trigger	(1 or 0) 1 if measured value is from a triggered charge collection, 0 if not
X (24)	Trigger Start High	High range trigger start value at time of measurement
Y (25)	Trigger Stop High	High range trigger stop value at time of measurement
Z (26)	Trigger Start Low	Low range trigger start value at time of measurement
AA (27)	Trigger Stop Low	Low range trigger stop value at time of measurement
AB (28)	Chamber Model	Model of chamber selected at time of measurement, if applicable
AC (29)	Serial Number	Serial number of chamber selected at time of measurement, if applicable
AD (30)	Beam/Isotope	Beam/isotope of chamber selected at time of measurement, if applicable
AE (31)	Coefficient	Coefficient of chamber selected at time of measurement, if applicable
AF (32)	Coefficient Units	Coefficient unit of chamber selected at time of measurement, if applicable
AG (33)	Report Name	Calibration report name of chamber selected at time of measurement, if applicable
AH (34)	Report Date	Calibration report date of chamber selected at time of measurement, if applicable
AI (35)	Cal Due Date	Calbration due date of chamber selected at time of measurement, if applicable
AJ (36)	Aion	A_{ion} value of chamber selected at time of measurement, if applicable
AK (37)	Polarity (VDC)	Calibration polarity value of chamber selected at time of measurement, if applicable

Rate Mode Ranges:	Low: 0.001 pA – 500.0 pA 0.001 – 0.999 pA 1.000 – 9.999 pA 10.00 – 99.99 pA 100.0 – 500.0 pA High: 0.001 nA – 500.0 nA 0.001 – 0.999 nA 1.000 – 9.999 nA 10.00 – 99.99 nA 100.0 – 500.0 nA
Charge Mode Ranges:	Low: 0.001 pC – 999.9 µC 0.001 – 9.999 pC 10.00 – 99.99 pC 100.0 – 999.9 pC 1.000 – 9.999 nC 10.00 – 99.99 nC 100.0 – 999.9 nC 1.000 – 9.999 µC 10.00 – 99.99 µC 100.0 – 999.9 µC High: 0.001 nC - 999.9 µC 0.001 – 9.999 nC 10.00 – 99.99 nC 100.0 – 999.9 nC 1.000 – 9.999 µC 10.00 – 99.99 µC 100.0 – 999.9 µC
Rated Effective Range on Input Currents:	0.400 pA – 500.0 nA (± .25% of minimum effective scale reading)
Range Switching:	User selectable
Display Resolution: LOW: Rate mode/Charge mode HIGH: Rate mode/Charge mode	 0.001 pA / 0.001 pC 0.001 nA / 0.001 nC
Main Software Functions:	Channel 1 Main Data and Setup Channel 2 Main Data and Setup Combined Channels Data and Setup Chamber Library Check Source Library Preferences
Charge Collection Modes:	Manual Start/Stop - User presses Start to begin collection and Stop to end Timed Mode - Selectable timer from 1 to 600 sec in 1 second increments Trigger Mode – current exceeding pre-selected trigger values starts and stops collection
Countup/Countdown Resolution:	1 second (count up for Manual Start/Stop Mode, count down for Timed Mode)
Trigger Levels for Charge Collection:	Set trigger start and stop levels via Preferences interface
Repeatability:	± 0.10%
Long Term Stability:	± 0.5% over 1 year
Stabilization Time:	± 0.1% of value at 1 hour for measurements taken at 15 minutes and 6 hours
Non-linearity:	± 0.25%
Zero Drift:	± 0.25%
Zero Shift:	± 0.25%
Response Time:	High range: < 2 s, Low range: 12 s

See www.standardimaging.com for applicable tech notes.
Specifications are subject to change without notice.

Operating Parameters: Temperature: Relative Humidity: Pressure:	 15 to 35 °C 20 to 80% non-condensing 650 to 770 mmHg
Storage Parameters: Temperature: Relative Humidity: Pressure:	 -15 to 50 °C 10 to 95% non-condensing 600 to 800 mmHg
Display:	Color LCD TFT touch screen. VGA (640x480) resolution, 6.4" diagonal
Input:	2 channels, BNC 2 lug triax
Bias Voltage:	± VDC for the following: 0 to 1000 VDC in 1 VDC increments, 350 µA max
Zeroing:	Zero via button push - Display indicates zeroing in progress.
Output:	RS232 (internal use only, not currently supported) (2) USB ports (Input devices only, keyboard or thumb drive – no mouse support) Ethernet (internal use only, not currently supported)
Chamber library calibration coefficients:	Amps Amp System factors: N_{sk}:µGym²/hA N_{sk}:Gym²/hA $N_{x,sk}$:Rm²/hA N_A:GBq/A N_A:Ci/A $N_{D,W}$:µGy/sec/A N_A:MBq/A N_A:µCi/A Coulombs Coulombs System Factors: N_k:Gy/C N_x:R/C N_{Gas}:Gy/C N_D:Gy/C $N_{D,W}$:Gy/C
Real-Time Clock:	On board, for data validation and storage
Audio:	On board speaker for audio feedback on start-up, button presses, operator alerts, etc.
Dimensions: Width: Height: Length:	 26.7 cm (10.5 in) 8.1 cm (3.2 in) 21.1 cm (8.3 in)
Mode of Operation:	Continuous
Weight:	1.4 kg (3.0 lbs)
Power Requirements:	100-240 VAC, 0.5 A max, 50/60 Hz input to external power supply, 9 VDC, 1.7 A power supply output to electrometer input, UL/TUV Listed Globtek®, Inc. power supply model GTM21089-1509-T3 The use of any power supply other than this UL/TUV recognized power supply GlobTek®, Inc. Model GTM21089-1509-T3 and using alternates other than the UL/CSA recognized power cord can degrade minimum safety. The proper replacements from Standard Imaging, Inc. are required for compliance with the requirements of IEC 60601-1.
Product Standards:	IEC 60601-1[1], IEC 60601-1-2[1], IEC 60601-1-4[2], IEC 60731[2] CE 0413 - Authorized representative for the EU is AMA, Ltd., St. Felix House, Flitcham, King's Lynn, Norfolk, United Kingdom, PE31 6BU. - Competent Authority for the EU is the Medical Products Agency, Sweden. - Notified Body for the EU is Semko, Sweden.
Shock Classifications:	Class I - External Power Supply Class II - Electrometer

See www.standardimaging.com for applicable tech notes.
Specifications are subject to change without notice.

[1] Externally Certified; [2] Designed to Meet

Customer Responsibility

This product and its components will perform properly and reliably only when operated and maintained in accordance with the instructions contained in this manual and accompanying labels. A defective device should not be used. Parts which may be broken or missing or are clearly worn, distorted or contaminated should be replaced immediately with genuine replacement parts manufactured by or made available from Standard Imaging, Inc.

⚠ **CAUTION: Federal law in the U.S.A. and Canadian law restrict the sale, distribution, or use of this product to, by, or on the order of a licensed medical practitioner. The use of this product should be restricted to the supervision of a qualified medical physicist. Measurement of high activity radioactive sources is potentially hazardous and should be performed by qualified personnel.**

Should repair or replacement of this product become necessary after the warranty period, the customer should seek advice from Standard Imaging Inc. prior to such repair or replacement. If this product is in need of repair, it should not be used until all repairs have been made and the product is functioning properly and ready for use. After repair, the product may need to be calibrated. The owner of this product has sole responsibility for any malfunction resulting from abuse, improper use or maintenance, or repair by anyone other than Standard Imaging, Inc.

The information in this manual is subject to change without notice. No part of this manual may be copied or reproduced in any form or by any means without prior written consent of Standard Imaging, Inc.

Service Policy

If service, including recalibration, is required, please contact Standard Imaging's Customer Service department by phone or email prior to shipping the product. Standard Imaging's Customer Service and Technical Service staff will attempt to address the product issue via phone or email. If unable to address the issue, a return material authorization (RMA) number will be issued. With the RMA number, the product can be returned to Standard Imaging. It is the responsibility of the customer to properly package, insure and ship the product, with the RMA number clearly identified on the outside of the package. The customer must immediately file a claim with their carrier for any shipping damage or lost shipments. Return shipping and insurance is to be pre-paid or billed to the customer, and the customer may request a specific shipper. Items found to be out of warranty are subject to a minimum service fee of 1 hour labor (excluding recalibrations) for diagnostic efforts and require a purchase order (PO) before service is performed. With concurrence from customer, the product may be replaced if it is unserviceable or if the required service is cost prohibitive. Products incurring service charges may be held for payment. Standard Imaging does not provide loaner products. See the Standard Imaging Warranty and Customer Responsibility for additional information.

Serialization Information

Standard Imaging products that are serialized contain coded logic in the serial number which indicates the product, day and year of manufacture, and a sequential unit number for identification:

A YY DDD X

A Unique product ID
YY Last two digits of the year (e.g. 1999 = 99, 2000 = 00)
DDD Day of the year (1≤ DDD ≤ 365)
X Unique unit ID Number (1 ≤ X ≤ 9)

Warranty

Standard Imaging, Inc. sells this product under the warranty herein set forth. The warranty is extended only to the buyer purchasing the product directly from Standard Imaging, Inc. or as a new product from an authorized dealer or distributor of Standard Imaging, Inc.

For a period provided in the table below from the date of original delivery to the purchaser or a distributor, this Standard Imaging, Inc. product, provided in the table is warranted against functional defects in design, materials and workmanship, provided it is properly operated under conditions of normal use, and that repairs and replacements are made in accordance herewith. The foregoing warranty shall not apply to normal wear and tear, or if the product has been altered, disassembled or repaired other than by Standard Imaging, Inc. or if the product has been subject to abuse, misuse, negligence or accident.

Product	Warranty Period
Standard Imaging Ionization Chambers	2 years
Standard Imaging Well Chambers	2 years
Standard Imaging Electrometers	2 years
Standard Imaging BeamChecker Products	2 years
Standard Imaging Software Products	1 year
All Other Standard Imaging Products	1 year
Standard Imaging Custom Products	1 year
Standard Imaging Remanufactured Products	180 days
Standard Imaging Custom Select Products	90 days
Consumables	90 days
Serviced Product	90 days
Resale Products	As defined by the Original Equipment Manufacturer
ADCL Product Calibration (Standard Imaging uses the UW-ADCL for recalibrations required under warranty)	0 - 90 days = 100% of ADCL Calibration Costs 91 - 182 days = 75% of ADCL Calibration Costs 183 – 365 days = 50% of ADCL Calibration Costs 366 – 639 days = 25% of ADCL Calibration Costs (days from date of shipment to customer)

Standard Imaging's sole and exclusive obligation and the purchaser's sole and exclusive remedy under the above warranties are, at Standard Imaging's option, limited to repairing, replacing free of charge or revising labeling and manual content on, a product: (1) which contains a defect covered by the above warranties; (2) which are reported to Standard Imaging, Inc. not later than seven (7) days after the expiration date of the warranty period in the table; (3) which are returned to Standard Imaging, Inc. promptly after discovery of the defect; and (4) which are found to be defective upon examination by Standard Imaging Inc. Transportation related charges, (including, but not limited to shipping, customs, tariffs, taxes, and brokerage fees) to Standard Imaging are the buyer's responsibility. This warranty extends to every part of the product except consumables (fuses, batteries, or glass breakage). Standard Imaging, Inc. shall not be otherwise liable for any damages, including but not limited to, incidental damages, consequential damages, or special damages. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

This warranty is in lieu of all other warranties, express or implied, whether statutory or otherwise, including any implied warranty of fitness for a particular purpose. In no event shall Standard Imaging, Inc. be liable for any incidental or consequential damages resulting from the use, misuse or abuse of the product or caused by any defect, failure or malfunction of the product, whether a claim of such damages is based upon the warranty, contract, negligence, or otherwise.

This warranty represents the current standard warranty of Standard Imaging, Inc. Please refer to the labeling or instruction manual of your Standard Imaging, Inc. product or the Standard Imaging, Inc. web page for any warranty conditions unique to the product.